

New Results on the Synthesis of Hs Isotopes

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Synthesis and investigation of heavy nuclei close to the deformed nuclear shells at $Z=108$ and $N=162$, especially of the even-even nucleus ^{270}Hs , provide important data for comparison with theoretical predictions. Relatively long half-lives for alpha decay and spontaneous fission were predicted for these nuclei [1,2]. The first chemical identification and the study of nuclear decay properties of Hs isotopes was accomplished in 2001 [3,4]. Gas phase chemical separation of Hs isotopes in the form of volatile HsO_4 provides a highly selective and very efficient method of isolation. Here we report preliminary results of a recent Hs chemistry experiment performed at the GSI UNILAC accelerator to measure the excitation function of the reaction $^{26}\text{Mg}(^{248}\text{Cm}, \text{xn})^{274-x}\text{Hs}$ and to obtain additional information on the decay properties of Hs isotopes and their daughters. Based on calculated excitation functions, experiments at beam energies of $E_{\text{lab}} = 135$ MeV and $E_{\text{lab}} = 145$ MeV in the center of the target were carried out. The resulting excitation energies of 40 MeV and 49 MeV correspond to the predicted maxima of the $4n$ and

$5n$ evaporation channel, respectively. The experimental procedure is described in [5]. Beam integrals of 1.46×10^{18} (145 MeV) and 2.02×10^{18} (135 MeV) ^{26}Mg ions were accumulated. A first, preliminary analysis of the data at 145 MeV revealed 7 decay chains attributed to the decay of Hs isotopes. These decay chains with observed α -particle or fission fragment energies in MeV, decay times, as well as detector number and top (T) or bottom (B) position are presented in Figure 1. The probabilities that the observed decay chains are of random origin are low and comparable to the values given in [3,4]. The data accumulated at 135 MeV is currently being analyzed.

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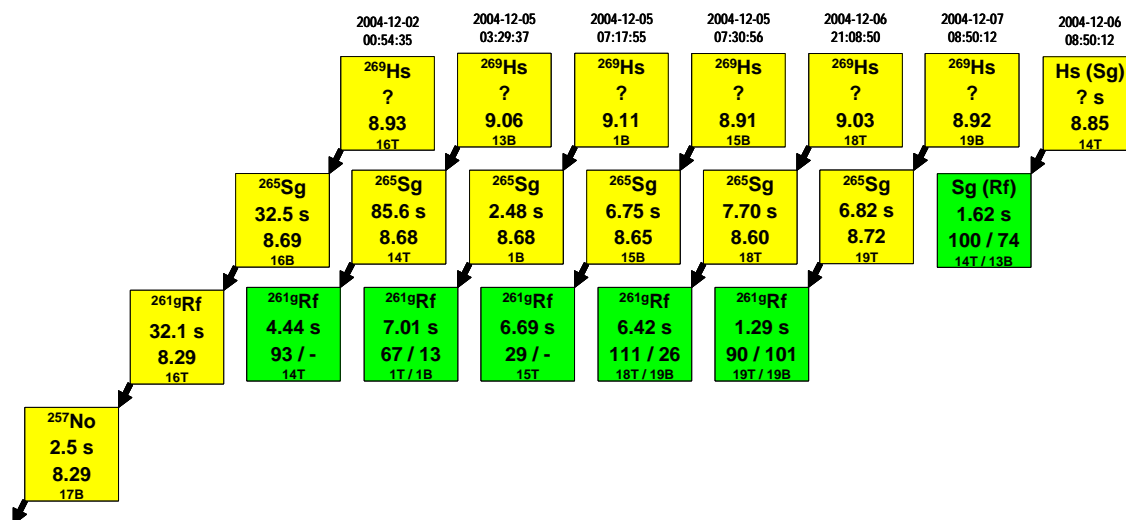


FIG. 1: Correlated decay chains observed in the 145-MeV run. Decay modes are color coded: α -decay (yellow), spontaneous fission (green). Given are the isotopic assignment, the lifetime, the measured energy in MeV, and the detector in which the event was registered (T=top; B=bottom detector).